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ABSTRACT

In response to the expressed needs of students for preparation materials and classes relevant to graduate entrance examinations, a course designed to provide a review of math topics was created as part of a reading and study skills laboratory. Reading specialists are able to interface math teaching with their varied training in diagnosis, diversified teaching methods, and reading and study skills. For this course, the reading specialists first diagnosed the students' strengths and weaknesses and then provided a program suited to the needs of each. They also emphasized the problem solving skills in math which closely parallel reading skills. In addition to teaching test-taking skills, the reading specialists were able to identify students encountering test or math anxiety and make appropriate referrals. Finally, because of their diversified teaching methods, they were able to meet the wide range of student needs and to use and interrelate a variety of materials. The course demonstrated that the reading specialists' expertise can be successfully extended to a content area. (FL)

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CAN A READING TEACHER TEACH A FRE MATH REVIEW?

YES!

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March 17, 1978

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY

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TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC) AND USERS OF THE ERIC SYSTEM."

CS 004343

Last summer, upon receiving our assignments for fall classes at RASSL, we panicked at the thought of teaching the GRE Math Review class. Our first thoughts were, "My God, it's been ten years since I've had a math class!, " Followed by "Can a reading teacher teach a GRE Math Review course?" "Is it possible?"

The purpose of this paper is to show the feasibility of expanding a learning assistance program by offering a Math Graduate Entrance Examination (MGEE) class through the utilization of existing reading and study skills personnel. It is our contention that a teacher of reading and study skills, or related areas, who has working knowledge of junior and senior high school math, can organize and teach a MGEE class. We base our contention on the belief that it is possible to interface general learning skills with a speciality such as math and that a college reading specialist can provide this interface.

There are a number of reasons that make it not only possible but desirable for a reading specialist to teach MGEE. One consideration is that students seek a supportive and non-threatening environment in which to review math; this environment can be provided by the reading specialist. A typical student at RASSL who

enrolls in a MGEE class can be exemplified as a senior, liberal arts major who has not taken a math course in a number of years and who lacks confidence in his math abilities. Stanley Kogelman, Creator of "Mind Over Math," a program which assists math anxious students, has stated that traditional math courses and instructors are viewed by students as being somewhat rigid. This perception tends to heighten students' math anxiety. The varied experiences of a reading specialist provide a sensitivity to learning and anxiety problems. A second reason for a reading specialist to teach this class is that he can capitalize on his non-mathematical background by explaining math concepts in layman's terms. He can also elicit student explanations, generating an atmosphere of shared knowledge and reinforcement. Another advantage is that the reading specialist has a background in diagnosis, diversified teaching methodologies, and reading and study skills which can be interfaced with the teaching of MGEE.

Course Description

The creation of RASSL's MGEE Program is a result of expressed needs on the part of University of Texas students for preparation materials and classes relevant to graduate entrance exams. The MGEE course is designed to provide a review of math topics tested on the Graduate Record Exam. Most of the mathematical abilities reviewed are those taught in jr. or sr. high school arithmetic, algebra and geometry. The aptitudes tested on the math section of the GRE, and those covered in MGEE class include arithmetic, ratio and proportion, percentages and averages, exponents and roots, geometry, and data and graph interpretation.

Interfacing Reading/Learning Skills With MGEE

Diagnosis

A reading specialist is trained to test, diagnose, and remediate reading skills. This type of knowledge, with some adaptation, can be applied to a MGEE class. For the specific diagnosis of math skills, a pre-test is recommended. The pre-test, which can be easily designed, consists of an adequate number sample problems applying concepts covered in the class. The format of the test follows the content outline, assisting the instructor in determining the students strengths and weaknesses. The results of the pre-test enable the student to focus on areas of weakness and to devote less time to areas in which his skills are already adequate. A student performing well on the pre-test can be self-paced in sections of the math material in which he desires review. The self-pacing of the competent student allows the instructor more class time to spend with students requiring additional assistance. The pre-test results also serve as a guide for recommending remedial help and materials.

Reading Comprehension/Problem Solving Skills

In addition to the diagnostic skills of a reading specialist, reading comprehension is applicable to the teaching of math. There are several reading skills which parallel problem solving skills in mathematics.

Reading Comprehension	Problem Solving
1. Find the main idea & significant details	1. Summarize & symbolize what is given & is required
2. Note key words	2. Note key words or conditions implying operation
3. Outline	3. Visualize problem
4. Anticipate conclusion	4. Formulate a tentative strategy to reach conclusion
5. Determine paragraph pattern	5. Reduce problem to similar or simpler type, work part of the problem relating it to the whole
6. Verbalize summary	6. In seeking help, verbalize thought process
7. Write clear summary	7. Organize solution to read in clear, logical manner
8. Review material	8. Check solutions against prior estimate, problem data & in light of definitions, concepts, data

These skills can be emphasized in class with the expectation that students will synthesize the problem solving steps through repeated application.

Testtaking

The teaching of testaking is another area of expertise which is applicable to MGEE. The GRE is a three hour "endurance" exam, sucess at which is partially determined by sufficient testtaking skills. Matthews (1) says that there is strong evidence that testwiseness leads to improved performance on achievement tests. Testtaking skills relevant to the GRE which are emphasized at RASSL are the following:

1. Prior familiarization with the test format, including working with sample problems
2. Mental and physical preparation

3. Reading directions carefully
4. Pacing (time & working easiest problems first)
5. Eliminating options
6. Avoiding negative self-talk ("I should have learned this years ago, I can't solve this now!")
7. Careful alignment of question/answer sheets
8. Underlining key words in questions

In the MGEE course, one class session can be devoted to a discussion of these skills with an ongoing incorporation of testwiseness when solving problems. In addition to teaching general testtaking skills, the reading specialist can identify students encountering intense test anxiety or math anxiety and make appropriate referrals.

Teaching Strategies

A fourth skills area in which a reading specialist has experience is innovative approaches to classroom teaching. Because of the wide range of student abilities, flexible teaching approaches are essential. Based on pre-test diagnoses, the instructor can use methodologies relevant to student needs. The individualization of instruction can be accomplished through self-pacing, grouping, one-to-one or group tutoring, and supplementing instruction through referrals. The role of the teacher in the class is one of a facilitator. He organizes and conducts the class whereby students work independently and/or in small groups solving problems, with his assistance. The facilitator is not responsible for teaching mathematical concepts and theories, but for explaining procedures for solving problems. Since the students in the MGEE class should not be fully dependent upon the instructor to dispense math concepts, the development of adequate self-instructional materials is essential. The materials reflect

the concepts, types of problems, and format of the GRE.

Content Outline
Unit 1 - Computational Skills

A. Whole numbers
   1. Addition and subtraction
   2. Multiplication and division

B. Properties of numbers
   1. Odds--evens
   2. Factors and divisibility
   3. Prime numbers, factorization into primes
   4. Least common multiple, greatest common divisor

C. Fractions
   1. Reducing and equivalent fractions
   2. Multiplication, division
   3. Reciprocals
   4. Addition and subtraction of unlike fractions

D. Decimal fractions
   1. Equivalent decimal fractions
   2. Addition, subtraction, multiplication of decimal fractions
   3. Division by whole numbers and decimal fractions
   4. Multiplication and division by powers of 10

Unit 2

A. Ratio-proportion

B. Percent

C. Averages

Unit 3 - Algebra and geometry measurement

A. Evaluation of algebraic expressions

B. Solution of open sentences
   1. Equalities and inequalities in 1 unknown and 2 equations in 2 unknowns
   2. Verbal problems

C. Exponents and roots
   1. Basic laws of exponents
   2. Square roots (emphasis on squaring, not taking roots)

D. Operations with algebraic fractions

E. Area and perimeter of triangle, parallelogram, rectangle, and square, and the diagonal of the square

F. Area and circumference of a circle

G. Isosceles and equilateral triangles, pythagorean theorem, right triangles, and special triangles

H. Angle measurement
   1. Acute, right obtuse, straight
   2. Vertical, sum of angles of triangle and quadrilateral, angle measurement related to parallel lines

Unit 4 - Data Interpretation

A. Bar, line, and circle graphs

B. Tables and charts

Materials Design

RASSL'S MGEE materials are subdivided into four units which are incorporated into three types of materials: 1) mini lessons, 2) workbooks 3) classbooks. For each of the four units, the mini lessons, workbooks and classbooks are interrelated. The mini lessons are a collection of one or two page summary sheets explaining basic math concepts and outlining the types of problems which are encountered in each unit. For example, a unit on geometry would be introduced by a mini lesson covering exponents and roots, triangles, the Pythagorean theorum and angle measurement. The mini lesson includes explanations of mathematical concepts, examples of problems, and brief hints on problem solving. Upon studying the mini lesson, the student may be apprised of his need to independently review the concepts more extensively than they are reviewed in class.

In conjunction with the mini lessons, student workbooks, containing exercises applying the concepts covered by the mini lessons are distributed. The workbooks provide problems and written solutions on the reverse side of each page. Students are encouraged to attempt their own solutions before checking their answers. The design of the workbooks allows for self-pacing and self-correction. The majority of class time is spent solving problems in the workbook, with the assistance of the facilitator. Due to the quantity of problems in the workbook and limited class time, students may need to complete the problems as homework.

The third type of material is the classbook, which consists of several short practice exercises, of approximately 5 to 10 minutes each, to be completed and discussed in class. The classbook also includes a 20 minute test, containing 15 problems. Solutions to these problems are discussed in class. These timed tests correspond to the approximate number of problems given in an allotted amount of time on the actual GRE.

Recommended Resources

A number of resources are available which will provide sample math problems and the appropriate format for the MGRE materials. Three primary resources are the current GRE Information Booklet, the current GRE Sample Test and Gruber's GRE Review Book. The first step in establishing a materials format is to analyze and categorize problems in the resources. These problems reflect the content outline. In analyzing materials, look for a good sampling of problems in each category, as well as the range of difficulty of the individual problems. In the GRE sample test, the problems are arranged in order of difficulty. It is recommended that the materials follow this organization, as it allows for student comprehension and retention of basic concepts before application is made to more complex problems.

Next, prepare written solutions for each problem that is used. Although some written solutions are included in the aforementioned resources, it may be necessary to generate original solutions. To benefit students, write detailed logical solutions which summarize and symbolize what is given and what is required to solve the problem. Include drawings or charts when appropriate to help the student visualize the necessary procedures. A brief statement summarizing the solution will help the student draw relationships

between problems. In constructing clear solutions, it may be necessary to seek the assistance of a math tutor or instructor.

In addition to the sources already mentioned, there is a plethora of other math materials from which additional problems can be taken. Some additional recommended resources are: 1) teacher's editions of jr. or sr. high school basic algebra and geometry textbooks; 2) packaged programs, i.e., Educulture Mini Courses in Basic Applied Mathematics and Algebra, Sargent-Welch Tutor Programs in Career Arithmetic, McGraw Hill Basic Skills Series-Fundamentals of Arithmetic, Fundamentals of Algebra, 3) Burstein, General Mathematical Ability.

CONCLUSION

After having taught two sessions of MGEE, we conclude that it is possible and advantageous for a reading specialist to teach this class. You can extend your expertise in study skills to a content area. You can expand the learning skills program to meet the needs of upperclassmen. As a tyro, you can identify with student anxieties and frustrations with math, and from this develop a rapport which rewards both you and the student. In accepting the challenge of designing and teaching this class, we have experienced some frustations, but lasting personal and professional rewards.

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